

UNITED STATES DEPARTMENT OF AGRICULTURE  
Agricultural Marketing Service  
Fruit and Vegetable Division  
Processed Products Branch

GENERAL MEMORANDUM NO. 10  
April 1997

Supersedes Memorandum Dated August 1994
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**SUBJECT: Orange Juice Colorimeter and Spectrophotometer Studies**

**TO: All Branch Personnel**

In 1985, the U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS) in cooperation with the Florida Department of Citrus (FDOC), and the Agricultural Marketing Service (AMS) completed a study of electronic calorimeters and spectrophotometers for use in the evaluation of "color" in orange juice. The study was based on a request from the Florida citrus processing industry to evaluate other instruments, thereby supplementing the approved HunterLab D45 and D45D2 Citrus Colorimeters.

Data was gathered by AMS Agricultural Commodity Graders during the 1984-1985 citrus processing season on samples of domestic juice from California and Florida and imported juice from various countries. ARS scientists assisted in designing the study, conducted statistical analysis of the data, and developed equations for values obtained from the instruments under evaluation. A technical report of the research was given at the Citrus Processing and Technology Conference, Lake Alfred, Florida, on October 16, 1985.

Since 1985, AMS and ARS have been conducting periodic evaluations of electronic orange juice calorimeters and spectrophotometers to monitor their performance. Based on these evaluations, the HunterLab LabScan Colorimeter (Model LS-5100) will be dropped from the list of approved calorimeters, effective September 2, 1994.

The following calorimeters and spectrophotometers with their respective equations are approved for products covered by the U.S. Standards for Grades of Orange Juice:

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List of Approved Colorimeters

HunterLab Citrus Colorimeter  
(Model D45/D45D2)  
(using OJ4 tube calibration)  
 $CN = 0.165 CR + 0.111 CY + 22.51$

List of Approved Spectrophotometers

Macbeth Color-Eye Spectrophotometer  
(Model 1500)  
(using white tile calibration)  
 $CN = 39.35 + 1.74X - 1.28Y - 0.94Z$

Macbeth Color-Eye Spectrophotometer  
(Model 2020+)  
(using white tile calibration)  
 $CN = 17(3.4X/Y - Z/Y + 5/Y) - 12.6$

Macbeth Color-Eye Spectrophotometer  
(Model 3000)  
(using white tile calibration)  
 $CN = 14.5(3.15X/Y - Z/Y + 5.2/Y) - 2.6$

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